

Attachment 8 consists of the following items:

- ✓ **Water Supply Background.** This attachment provides an overview of water supply in the region and within the City of San Marcos.
- ✓ **Project Costs.** The total costs associated with the project are presented.
- ✓ **Water Supply Benefits.** The body of this attachment provides a description of the water supply benefits associated with implementation of the *San Marcos Creek Floodway Improvement Project*.

This attachment contains estimations of the water supply benefits, as well as the total costs associated with the *San Marcos Creek Floodway Improvement Project*. Section 1 provides a summary of the local and regional water supply background with respect to the San Diego IRWM Region as well as with respect to the project area. Section 2 contains a narrative description of the expected costs that would be incurred to implement and operate the project over the project's lifetime (through 2060). Section 3 contains a narrative description of the expected water supply benefits of the *San Marcos Creek Floodway Improvement Project*, which are equivalent to the water supply benefits associated with this grant proposal. Where possible, each benefit was quantified and presented in physical or economic terms. In cases where quantitative analyses were not feasible, this attachment provides complimentary qualitative analyses. In addition, this attachment provides a description of economic factors that may affect or qualify the amount of economic benefits to be realized.

## Water Supply Background

### Regional

The San Diego region comprises eleven parallel and similar hydrologic units that discharge to coastal bays, estuaries, or lagoons. Due to low and unreliable quantities of precipitation, the region has a limited local water supply and has therefore depended largely on imported water from Northern California rivers, the Bay Delta, and the Colorado River for over sixty years. The adopted San Diego IRWM Plan recognizes that it is important to increase the local water supply, which is reflected in Goal 1 of the IRWM Plan: *optimize local water supply reliability*.

The San Diego County Water Authority (SDCWA) purchases the majority of the region's imported water (sourced from the State Water Project (SWP) and the Colorado River Aqueduct (CRA)) from the Metropolitan Water District of Southern California (MWD), and receives additional imported supplies from the Colorado River through a conservation and transfer agreement with the Imperial Irrigation District (IID). SDCWA, as the only water wholesaler within the Region, distributes the aforementioned supply to its 24 member agencies, which include all major water agencies in the San Diego region. The amount of water imported into the region varies depending on hydrologic conditions, but in general the region's water supply consist of 70 to 90 percent imported water. In 2008, approximately 88 percent of the region's water supply was imported, 76 percent of this water was purchased by SDCWA from MWD, and the remaining 12 percent came from the Colorado River (through the IID transfer). The remaining water supply in the region consists of conservation, recycled water, local surface water, and groundwater, with approximately 10 to 30 percent coming from these sources. It is anticipated that future water supplies may also consist of desalinated water, although this water sources is not currently available in the region.

One of the most significant issues for the region is the availability and reliability of its imported water supplies. The SWP is the major source of imported supply, followed by water from the CRA. Recent legal decisions to protect the endangered Delta smelt have drastically reduced the amount of Delta pumping that can be conducted, cutting back on the volume of SWP water that can be delivered. This situation, coupled with the recent droughts affecting both the SWP and CRA and further reducing available supplies, serves as a reminder that the region's water supply is vulnerable to events outside the region. The region faces a critical need for improved local supplies, and local water agencies have identified the need to increase local supplies as a key element in meeting future regional water demands.

Absent increased conservation efforts, as well as cultivation of local surface water, groundwater, desalinated water, and recycled water supplies, the region will continue to be vulnerable to unreliable imported supplies, and will continue to suffer the economic consequences of additional cutbacks in imported supplies. This trend of will continue until the region develops reliable local supplies.

### Local

San Marcos Creek, which would be improved upon by this proposal, flows into a small privately owned reservoir located within the San Marcos Creek watershed (Lake San Marcos). The lake currently suffers algal blooms and has been placed on the San Diego RWQCB list of impaired water bodies (303(d) list) for nutrients, ammonia, and phosphorus. These water quality issues have substantially reduced the ability for Lake San Marcos to function as a usable water supply for agricultural users, as well as two local golf courses that are dependent on Lake San Marcos for irrigation.

### Cost of Imported Water

As described above, imported water supply in the San Diego region constitutes approximately 70 to 90 percent of the region's water supply. Water produced by conservation, recycling, groundwater extraction, and other "local sources" will offset the need to use imported water supply. The value of adding new local supplies can thus be estimated based on the costs avoided by reducing local demands for imported water. For the *San Marcos Creek Floodway Improvement Project*, the project benefits associated with avoidance of imported water are based on the assumptions below.

The avoided cost of purchasing imported water from SDCWA are calculated based on MWD's Tier 1 water rates and include additional SDCWA and MWD fixed charges. Table 8-1 shows the total "all in" rates for imported water supply from SDCWA in \$2010 to illustrate the high cost of imported water supply and associated need to protect and enhance local supplies. The total "all in" water rates for M&I supplies purchased from SDCWA are \$864 for untreated water and \$1,079 for treated water (in 2010 dollars).

**Table 8-1: San Diego Region Water Rates Effective January 1, 2011 (\$2010)**

|  | Untreated (\$/AF) | Treated (\$/AF) |
|--|-------------------|-----------------|
| <b>Volumetric Charges<sup>1</sup></b>                  |                   |                 |
| Melded Supply Rate                                     | \$597             | \$812           |
| Transportation   | \$75              | \$75            |
| Melded Tier 1  | \$672             | \$887           |
| <b>Fixed Charges (in Volumetric Terms)<sup>1</sup></b> |                   |                 |
| Storage  | \$95              | \$95            |
| Customer Service                                       | \$44              | \$44            |
| Total Fixed Charges                                    | \$139             | \$139           |
| <b>Total SDCWA Costs for M&amp;I Water</b>             | <b>\$811</b>      | <b>\$1,026</b>  |
| <b>Additional MWD Fixed Charges<sup>2</sup></b>        |                   |                 |
| Capacity Charge  | \$14              | \$14            |
| Readiness to Serve Charge                              | \$39              | \$39            |
| <b>Total "All In" Costs for M&amp;I Water</b>          | <b>\$864</b>      | <b>\$1,079</b>  |

Sources:

1 San Diego County Water Authority. June 24, 2010. Public Hearing: Recommended CY 2011 Rates and Charges.

2 City of San Diego. October 27, 2010. CY 2011 Rate Fact Sheet: SDCWA Water Rates for the City of San Diego Effective January 1, 2011.

## Project Costs

As detailed within Attachment 7, total estimated budget for the *San Marcos Stormwater Flood Management Proposal* is \$12,158,258, for a total present value \$12,744,409 when considering discounting and projected maintenance costs. The annual costs of the *San Marcos Creek Floodway Improvement Project* are equivalent for flood damage reduction as well as water supply, water quality, and other water-related benefits. This is because the capital and maintenance costs for this project will work to provide a suite of benefits, and are not segmented by benefit type. Table 8-2 below provides information regarding the total project costs, which are the same as those presented within Attachment 7. Refer to Attachment 7 for more information regarding how these costs were reached.

**Table 8-2: Annual Project Costs**

| Table 14 - Annual Cost of Water Supply Project<br>(All costs in 2009 dollars) |                    |                                  |           |             |             |             |                         |                          |                            |
|---|--------------------|----------------------------------|-----------|-------------|-------------|-------------|-------------------------|--------------------------|----------------------------|
| Year  | Initial Costs      | Operations and Maintenance Costs |           |             |             |             |                         | Discounting Calculations |                            |
|   | (a)                | (b)                              | (c)       | (d)         | (e)         | (f)         | (g)                     | (h)                      | (i)                        |
|   | Total Project Cost | Admin                            | Operation | Maintenance | Replacement | Other       | Total Costs (a)+...+(f) | Discount Factor          | Discounted Costs (g) x (h) |
| 2009  | \$0                | \$0                              | \$0       | \$0         | \$0         | \$0         | \$0                     | 1.000                    | \$0                        |
| 2010  | \$0                | \$0                              | \$0       | \$0         | \$0         | \$0         | \$0                     | 0.943                    | \$0                        |
| 2011  | \$2,055,422        | \$0                              | \$0       | \$0         | \$0         | \$0         | \$2,055,422             | 0.890                    | \$1,829,319                |
| 2012  | \$4,052,753        | \$0                              | \$0       | \$0         | \$0         | \$0         | \$4,052,753             | 0.840                    | \$3,402,769                |
| 2013  | \$4,052,753        | \$0                              | \$0       | \$0         | \$0         | \$0         | \$4,052,753             | 0.792                    | \$3,210,160                |
| 2014  | \$1,997,330        | \$0                              | \$0       | \$0         | \$0         | \$0         | \$1,997,330             | 0.747                    | \$1,492,521                |
| 2015  | \$0                | \$0                              | \$0       | \$6,000     | \$0         | \$2,000,000 | \$2,006,000             | 0.705                    | \$1,414,151                |
| 2016  | \$0                | \$0                              | \$0       | \$6,000     | \$0         | \$2,000,000 | \$2,006,000             | 0.665                    | \$1,334,105                |
| 2017  | \$0                | \$0                              | \$0       | \$6,000     | \$0         | \$0         | \$6,000                 | 0.627                    | \$3,764                    |
| 2018  | \$0                | \$0                              | \$0       | \$6,000     | \$0         | \$0         | \$6,000                 | 0.592                    | \$3,551                    |
| 2019  | \$0                | \$0                              | \$0       | \$6,000     | \$0         | \$0         | \$6,000                 | 0.558                    | \$3,350                    |
| 2020  | \$0                | \$0                              | \$0       | \$6,000     | \$0         | \$0         | \$6,000                 | 0.527                    | \$3,161                    |
| 2021  | \$0                | \$0                              | \$0       | \$6,000     | \$0         | \$0         | \$6,000                 | 0.497                    | \$2,982                    |
| 2022  | \$0                | \$0                              | \$0       | \$6,000     | \$0         | \$0         | \$6,000                 | 0.469                    | \$2,813                    |
| 2023  | \$0                | \$0                              | \$0       | \$6,000     | \$0         | \$0         | \$6,000                 | 0.442                    | \$2,654                    |
| 2024  | \$0                | \$0                              | \$0       | \$6,000     | \$0         | \$0         | \$6,000                 | 0.417                    | \$2,504                    |
| 2025  | \$0                | \$0                              | \$0       | \$6,000     | \$0         | \$0         | \$6,000                 | 0.394                    | \$2,362                    |
| 2026  | \$0                | \$0                              | \$0       | \$6,000     | \$0         | \$0         | \$6,000                 | 0.371                    | \$2,228                    |
| 2027  | \$0                | \$0                              | \$0       | \$6,000     | \$0         | \$0         | \$6,000                 | 0.350                    | \$2,102                    |
| 2028  | \$0                | \$0                              | \$0       | \$6,000     | \$0         | \$0         | \$6,000                 | 0.331                    | \$1,983                    |
| 2029  | \$0                | \$0                              | \$0       | \$6,000     | \$0         | \$0         | \$6,000                 | 0.312                    | \$1,871                    |
| 2030  | \$0                | \$0                              | \$0       | \$6,000     | \$0         | \$0         | \$6,000                 | 0.294                    | \$1,765                    |
| 2031  | \$0                | \$0                              | \$0       | \$6,000     | \$0         | \$0         | \$6,000                 | 0.278                    | \$1,665                    |
| 2032  | \$0                | \$0                              | \$0       | \$6,000     | \$0         | \$0         | \$6,000                 | 0.262                    | \$1,571                    |
| 2033  | \$0                | \$0                              | \$0       | \$6,000     | \$0         | \$0         | \$6,000                 | 0.247                    | \$1,482                    |
| 2034  | \$0                | \$0                              | \$0       | \$6,000     | \$0         | \$0         | \$6,000                 | 0.233                    | \$1,398                    |
| 2035  | \$0                | \$0                              | \$0       | \$6,000     | \$0         | \$0         | \$6,000                 | 0.220                    | \$1,319                    |
| 2036  | \$0                | \$0                              | \$0       | \$6,000     | \$0         | \$0         | \$6,000                 | 0.207                    | \$1,244                    |
| 2037  | \$0                | \$0                              | \$0       | \$6,000     | \$0         | \$0         | \$6,000                 | 0.196                    | \$1,174                    |
| 2038  | \$0                | \$0                              | \$0       | \$6,000     | \$0         | \$0         | \$6,000                 | 0.185                    | \$1,107                    |
| 2039  | \$0                | \$0                              | \$0       | \$6,000     | \$0         | \$0         | \$6,000                 | 0.174                    | \$1,045                    |
| 2040  | \$0                | \$0                              | \$0       | \$6,000     | \$0         | \$0         | \$6,000                 | 0.164                    | \$986                      |
| 2041  | \$0                | \$0                              | \$0       | \$6,000     | \$0         | \$0         | \$6,000                 | 0.155                    | \$930                      |
| 2042  | \$0                | \$0                              | \$0       | \$6,000     | \$0         | \$0         | \$6,000                 | 0.146                    | \$877                      |
| 2043  | \$0                | \$0                              | \$0       | \$6,000     | \$0         | \$0         | \$6,000                 | 0.138                    | \$827                      |

**Table 14 - Annual Cost of Water Supply Project**  
(All costs in 2009 dollars)

| Year                | Initial Costs  | Operations and Maintenance Costs |           |             |             |       |                         | Discounting Calculations |                            |
|---------------------|--|----------------------------------|-----------|-------------|-------------|-------|-------------------------|--------------------------|----------------------------|
|                     | (a)  | (b)                              | (c)       | (d)         | (e)         | (f)   | (g)                     | (h)                      | (i)                        |
|                     | Total Project Cost   | Admin                            | Operation | Maintenance | Replacement | Other | Total Costs (a)+...+(f) | Discount Factor          | Discounted Costs (g) x (h) |
| 2044                | \$0  | \$0                              | \$0       | \$6,000     | \$0         | \$0   | \$6,000                 | 0.130                    | \$781                      |
| 2045                | \$0  | \$0                              | \$0       | \$6,000     | \$0         | \$0   | \$6,000                 | 0.123                    | \$736                      |
| 2046                | \$0  | \$0                              | \$0       | \$6,000     | \$0         | \$0   | \$6,000                 | 0.116                    | \$695                      |
| 2047                | \$0  | \$0                              | \$0       | \$6,000     | \$0         | \$0   | \$6,000                 | 0.109                    | \$655                      |
| 2048                | \$0  | \$0                              | \$0       | \$6,000     | \$0         | \$0   | \$6,000                 | 0.103                    | \$618                      |
| 2049                | \$0  | \$0                              | \$0       | \$6,000     | \$0         | \$0   | \$6,000                 | 0.097                    | \$583                      |
| 2050                | \$0  | \$0                              | \$0       | \$6,000     | \$0         | \$0   | \$6,000                 | 0.092                    | \$550                      |
| 2051                | \$0  | \$0                              | \$0       | \$6,000     | \$0         | \$0   | \$6,000                 | 0.087                    | \$519                      |
| 2052                | \$0  | \$0                              | \$0       | \$6,000     | \$0         | \$0   | \$6,000                 | 0.082                    | \$490                      |
| 2053                | \$0  | \$0                              | \$0       | \$6,000     | \$0         | \$0   | \$6,000                 | 0.077                    | \$462                      |
| 2054                | \$0  | \$0                              | \$0       | \$6,000     | \$0         | \$0   | \$6,000                 | 0.073                    | \$436                      |
| 2055                | \$0  | \$0                              | \$0       | \$6,000     | \$0         | \$0   | \$6,000                 | 0.069                    | \$411                      |
| 2056                | \$0  | \$0                              | \$0       | \$6,000     | \$0         | \$0   | \$6,000                 | 0.065                    | \$388                      |
| 2057                | \$0  | \$0                              | \$0       | \$6,000     | \$0         | \$0   | \$6,000                 | 0.061                    | \$366                      |
| 2058                | \$0  | \$0                              | \$0       | \$6,000     | \$0         | \$0   | \$6,000                 | 0.058                    | \$345                      |
| 2059                | \$0  | \$0                              | \$0       | \$6,000     | \$0         | \$0   | \$6,000                 | 0.054                    | \$326                      |
| 2060                | \$0  | \$0                              | \$0       | \$6,000     | \$0         | \$0   | \$6,000                 | 0.051                    | \$307                      |
| <b>Project Life</b> | <b>Total Present Value of Discounted Costs (Sum of Column (i))</b> |                                  |           |             |             |       |                         |                          | <b>\$12,744,409</b>        |

## Water Supply Benefits

The water supply benefits that are anticipated to result from implementation of the *San Marcos Creek Floodway Improvement Project* are summarized below in Table 8-3, and the cost-benefit overview is summarized in Table 8-4. As described below, this project would not result in monetized water supply benefits, but would result in qualitative water supply reliability benefits.

**Table 8-3: Benefits Summary**

| Type of Benefit                               | Assessment Level | Beneficiaries      |
|---|------------------|--------------------|
| <b>Water Supply Benefits</b>                  |                  |                    |
| Avoided Imported Water Purchases              | Monetized        | Local and Regional |
| Increased Viability of Local Orchard Industry | Qualitative      | Local and Regional |
| Water Supply Reliability                      | Qualitative      | Local and Regional |

**Table 8-4: Benefit-Cost Analysis Overview**

|   | Present Value (\$2009)               |
|---|--------------------------------------|
| <b>Costs – Total Capital and O&amp;M</b>      | <b>\$12,744,409</b>                  |
| <b>Monetizable Benefits</b>                   |                                      |
| Avoided Imported Water Purchases              | \$1,960,016                          |
| <b>Qualitative Benefits</b>                   | <b><u>Qualitative Indicator*</u></b> |
| Increased Viability of Local Orchard Industry | +                                    |
| Water Supply Reliability                      | +                                    |

\* Magnitude of effect on net benefits:

+/- (negligible or unknown); + (moderate positive); ++ (significant positive); - (moderate negative); -- (significant negative)

### **The “Without Project” Baseline**

Existing conditions (without project) are those analyzed within the 2007 Environmental Impact Report conducted for the City of San Marcos on the San Marcos Creek Specific Plan (HDR 2007). This report demonstrated that the existing floodway and corresponding 100-year floodplain spanned throughout the downtown area of San Marcos, and would affect a multitude of residential and commercial developments. The baseline also includes water quality and water supply issues relating to Lake San Marcos and two local golf courses. The entire project area is served by the Vallecitos Water District (VWD), which receives all of its water from imported sources from SDCWA. The two local golf courses adjacent to Lake San Marcos currently rely on water from the lake for turf irrigation.

### **Benefits Analysis**

#### ***Avoided Imported Water Purchases***

Lake San Marcos currently provides water supply to agricultural users and two golf courses (Lake San Marcos Country Club and Lake San Marcos Executive Course) adjacent to the project area. These golf courses rely on Lake San Marcos for irrigation of all greens and fairways. The Citizens Development Corporation, which owns both golf courses, has water rights issued by the State Water Rights Board for 480 AFY from San Marcos Creek (State Water Rights Board 1963).

Recent studies suggest that local surface and ground waters within the San Marcos area have high levels of nutrients, DDE, total suspended solids (TSS), total dissolved solids (TDS), and sediment toxicity. The City of San Marcos reports that ammonia and phosphorus concentrations exceed respective aquatic life thresholds, therefore resulting in development of the *Upper San Marcos Creek Watershed Nutrient Management Plan* (City of San Marcos et al 2010). High nutrient, TSS, and TDS concentrations can be detrimental to turfgrass if improperly managed. VWD reports that TDS concentrations averaged 1,337 mg/L in the San Marcos area (Todd Engineers 2005). As an industry standard for golf courses, TDS levels greater than 1,000 mg/L are considered too saline for irrigation uses and must be treated prior to application. Information from the local golf courses within the vicinity of the *San Marcos Creek Floodway Improvement Project* suggests that these golf courses may have to blend high TDS local supplies with imported water from VWD (purchased through SDCWA) in order to reduce TDS levels at or below the 1,000 mg/L threshold. VWD reports that average TDS levels in imported supplies range from 580 to 612 ppm (VWD 2009). Continued degradation of Lake San Marcos surface water would result in the need for the golf courses to begin blending in order to maintain turf quality.

In addition, studies demonstrate that high nutrient loading, especially when coupled with TDS, can substantially impact turfgrass. A recent study found that excess nutrient loading can induce deficiencies in other nutrients (through leaching), which becomes a more substantial issue when turfgrass systems are already impacted by salts (Duncan et al 2000). Secondly, nitrogen at excessive levels has been found to suppress roots by decreasing total root weight and therefore causing wilting under drought stress or increased mortality in cool climate conditions (Duncan et al 2000). Nitrogen levels between 11.3 and 22.6 mg/L are considered “high” and nitrogen levels exceeding 22.6 mg/L are considered “very high,” and could potentially generate nutrient-related impacts (Landschoot 2011). Similarly, nitrate (NO<sub>3</sub>) levels from 50-100 mg/L are considered “high” and NO<sub>3</sub> levels exceeding 100 mg/L are considered “very high” (Landschoot 2011). VWD reports that average nitrogen levels were 21 mg/L and average NO<sub>3</sub> levels were 92 mg/L in the San Marcos area (Todd Engineers 2005). Therefore, existing water quality within the vicinity of the project area are known to contain high nitrogen and nitrate levels, which could negatively impact turfgrass quality. Without removing nutrient pollutant sources, the best way to manage nutrients is by flushing them (through dilution) with other water sources (Duncan et al 2000).

Riparian and aquatic vegetation (including macrophytes) have been demonstrated to absorb nutrients and other substances from urban runoff, therefore reducing pollutant loads in surface waters (refer to discussion in Attachment 9). A reduction in pollutant loading, namely in reduction of nutrients, TSS, and TDS, as a result of the *San Marcos Creek Floodway Improvement Project* would allow the continued beneficial use of surface waters in the San Marcos area for irrigation purposes.

Without those water quality improvements, the Citizens Development Corporation may be forced to blend imported water with their local San Marcos Creek supply to maintain turfgrass vigor. In order to maintain high quality water supply for turf irrigation, this analysis assumes a blending ratio of approximately 30%



imported water to local supply. As such, the Citizens Development Corporation (CDC) would have to purchase approximately 144 AFY (30% of their 480 AFY water right) of imported water supply from VWD for blending. Table 8-5 provides a summary of the avoided imported water purchases that could result from the proposed stormwater quality efforts.

**Table 8-5: Avoided Imported Water Purchases**

|   | Average Annual Cost | Years | Total Cost         |
|---|---------------------|-------|--------------------|
| Avoided Imported Water Purchases to Maintain High Quality Water for Turf Irrigation | \$187,494           | 46    | \$8,624,741        |
| <b>Total Avoided Imported Water Purchases</b>                                       |                     |       | <b>\$8,624,741</b> |
| <b>Total Avoided Imported Water Purchases after Discounting</b>                     |                     |       | <b>\$1,960,016</b> |

In accordance with Table 8-5 above and information presented herein, this analysis assumes that implementation of the *San Marcos Creek Floodway Improvement Project* would result in an annual decrease of 144 AF of treated imported water from 2015 to 2060. In total, from 2015 to 2060, this proposal would potentially result in 6,624 AF of water savings. These water savings were monetized using the SDCWA treated water rates over the lifetime of the project (until 2060), which was calculated at a total value of \$1,960,016 after discounting. Table 8-6 provides detailed information regarding the annual water supply benefits, which are presented in 2009 dollars.

**Table 8-6: Annual Water Supply Benefits**

| Table 15 - Annual Water Supply Benefits<br>(All costs in 2009 dollars) |  |                  |   |                   |                             |  |                     |                                 |
|--|--|------------------|---|-------------------|-----------------------------|--|---------------------|---------------------------------|
| (a) Year   | (b) Type of Benefit: Avoided Water Imports |                  |   |                   |                             | Discounting Calculations for Economic Benefits |                     |                                 |
|  | (c) Measure of Benefit [Unit]: AFY         |                  |   |                   |                             |  |                     |                                 |
|  | (d) Without Project                        | (e) With Project | (f) Change Resulting from Project [e - d] | (g) Unit \$ Value | (h) Annual \$ Value [f x g] | (h) Total Annual Benefits (\$)                 | (i) Discount Factor | (j) Discounted Benefits [h x i] |
| 2009   | --   | --               | --  | --                | --                          | --   | 1.000               | --                              |
| 2010   | --   | --               | --  | --                | --                          | --   | 0.943               | --                              |
| 2011   | --   | --               | --  | --                | --                          | --   | 0.890               | --                              |
| 2012   | --   | --               | --  | --                | --                          | --   | 0.840               | --                              |
| 2013   | --   | --               | --  | --                | --                          | --   | 0.792               | --                              |
| 2014   | --   | --               | --  | --                | --                          | --   | 0.747               | --                              |
| 2015   | -144                                       | 0                | 144                                       | \$917             | \$132,091                   | \$132,091                                      | 0.705               | \$93,124                        |
| 2016   | -144                                       | 0                | 144                                       | \$950             | \$136,869                   | \$136,869                                      | 0.665               | \$91,018                        |
| 2017   | -144                                       | 0                | 144                                       | \$985             | \$141,819                   | \$141,819                                      | 0.627               | \$88,921                        |
| 2018   | -144                                       | 0                | 144                                       | \$1,020           | \$146,949                   | \$146,949                                      | 0.592               | \$86,994                        |
| 2019   | -144                                       | 0                | 144                                       | \$1,057           | \$152,264                   | \$152,264                                      | 0.558               | \$84,963                        |
| 2020   | -144                                       | 0                | 144                                       | \$1,096           | \$157,771                   | \$157,771                                      | 0.527               | \$83,145                        |
| 2021   | -144                                       | 0                | 144                                       | \$1,106           | \$159,317                   | \$159,317                                      | 0.497               | \$79,181                        |
| 2022   | -144                                       | 0                | 144                                       | \$1,117           | \$160,879                   | \$160,879                                      | 0.469               | \$75,452                        |
| 2023   | -144                                       | 0                | 144                                       | \$1,128           | \$162,456                   | \$162,456                                      | 0.442               | \$71,806                        |
| 2024   | -144                                       | 0                | 144                                       | \$1,139           | \$164,049                   | \$164,049                                      | 0.417               | \$68,408                        |
| 2025   | -144                                       | 0                | 144                                       | \$1,150           | \$165,657                   | \$165,657                                      | 0.390               | \$64,606                        |
| 2026   | -144                                       | 0                | 144                                       | \$1,162           | \$167,281                   | \$167,281                                      | 0.371               | \$62,061                        |
| 2027   | -144                                       | 0                | 144                                       | \$1,173           | \$168,921                   | \$168,921                                      | 0.350               | \$59,122                        |
| 2028   | -144                                       | 0                | 144                                       | \$1,185           | \$170,577                   | \$170,577                                      | 0.331               | \$56,461                        |
| 2029   | -144                                       | 0                | 144                                       | \$1,196           | \$172,249                   | \$172,249                                      | 0.312               | \$53,742                        |
| 2030   | -144                                       | 0                | 144                                       | \$1,208           | \$173,938                   | \$173,938                                      | 0.294               | \$51,138                        |
| 2031   | -144                                       | 0                | 144                                       | \$1,220           | \$175,643                   | \$175,643                                      | 0.278               | \$48,829                        |
| 2032   | -144                                       | 0                | 144                                       | \$1,232           | \$177,365                   | \$177,365                                      | 0.262               | \$46,470                        |

**Table 15 - Annual Water Supply Benefits**  
(All costs in 2009 dollars)

| (a) Year   | (b) Type of Benefit: Avoided Water Imports |                  |   |                   |                             | Discounting Calculations for Economic Benefits |                     |                                 |
|--|--|------------------|---|-------------------|-----------------------------|--|---------------------|---------------------------------|
|  | (c) Measure of Benefit [Unit]: AFY         |                  |   |                   |                             |  |                     |                                 |
|  | (d) Without Project                        | (e) With Project | (f) Change Resulting from Project [e - d] | (g) Unit \$ Value | (h) Annual \$ Value [f x g] | (h) Total Annual Benefits (\$)                 | (i) Discount Factor | (j) Discounted Benefits [h x i] |
| 2033   | -144                                       | 0                | 144                                       | \$1,244           | \$179,104                   | \$179,104                                      | 0.247               | \$44,239                        |
| 2034   | -144                                       | 0                | 144                                       | \$1,256           | \$180,860                   | \$180,860                                      | 0.233               | \$42,140                        |
| 2035   | -144                                       | 0                | 144                                       | \$1,268           | \$182,633                   | \$182,633                                      | 0.220               | \$40,179                        |
| 2036   | -144                                       | 0                | 144                                       | \$1,281           | \$184,423                   | \$184,423                                      | 0.207               | \$38,176                        |
| 2037   | -144                                       | 0                | 144                                       | \$1,293           | \$186,231                   | \$186,231                                      | 0.196               | \$36,501                        |
| 2038   | -144                                       | 0                | 144                                       | \$1,306           | \$188,057                   | \$188,057                                      | 0.185               | \$34,791                        |
| 2039   | -144                                       | 0                | 144                                       | \$1,319           | \$189,901                   | \$189,901                                      | 0.174               | \$33,043                        |
| 2040   | -144                                       | 0                | 144                                       | \$1,332           | \$191,763                   | \$191,763                                      | 0.164               | \$31,449                        |
| 2041   | -144                                       | 0                | 144                                       | \$1,345           | \$193,642                   | \$193,642                                      | 0.155               | \$30,015                        |
| 2042   | -144                                       | 0                | 144                                       | \$1,358           | \$195,541                   | \$195,541                                      | 0.146               | \$28,549                        |
| 2043   | -144                                       | 0                | 144                                       | \$1,371           | \$197,458                   | \$197,458                                      | 0.138               | \$27,249                        |
| 2044   | -144                                       | 0                | 144                                       | \$1,385           | \$199,394                   | \$199,394                                      | 0.130               | \$25,921                        |
| 2045   | -144                                       | 0                | 144                                       | \$1,398           | \$201,348                   | \$201,348                                      | 0.123               | \$24,766                        |
| 2046   | -144                                       | 0                | 144                                       | \$1,412           | \$203,322                   | \$203,322                                      | 0.116               | \$23,585                        |
| 2047   | -144                                       | 0                | 144                                       | \$1,426           | \$205,315                   | \$205,315                                      | 0.109               | \$22,379                        |
| 2048   | -144                                       | 0                | 144                                       | \$1,440           | \$207,328                   | \$207,328                                      | 0.103               | \$21,355                        |
| 2049   | -144                                       | 0                | 144                                       | \$1,454           | \$209,361                   | \$209,361                                      | 0.097               | \$20,308                        |
| 2050   | -144                                       | 0                | 144                                       | \$1,468           | \$211,413                   | \$211,413                                      | 0.092               | \$19,450                        |
| 2051   | -144                                       | 0                | 144                                       | \$1,483           | \$213,486                   | \$213,486                                      | 0.087               | \$18,573                        |
| 2052   | -144                                       | 0                | 144                                       | \$1,497           | \$215,579                   | \$215,579                                      | 0.082               | \$17,677                        |
| 2053   | -144                                       | 0                | 144                                       | \$1,512           | \$217,693                   | \$217,693                                      | 0.077               | \$16,762                        |
| 2054   | -144                                       | 0                | 144                                       | \$1,527           | \$219,827                   | \$219,827                                      | 0.073               | \$16,047                        |
| 2055   | -144                                       | 0                | 144                                       | \$1,542           | \$221,982                   | \$221,982                                      | 0.069               | \$15,317                        |
| 2056   | -144                                       | 0                | 144                                       | \$1,557           | \$224,158                   | \$224,158                                      | 0.065               | \$14,570                        |
| 2057   | -144                                       | 0                | 144                                       | \$1,572           | \$226,356                   | \$226,356                                      | 0.061               | \$13,808                        |
| 2058   | -144                                       | 0                | 144                                       | \$1,587           | \$228,575                   | \$228,575                                      | 0.058               | \$13,257                        |
| 2059   | -144                                       | 0                | 144                                       | \$1,603           | \$230,816                   | \$230,816                                      | 0.054               | \$12,531                        |
| 2060   | -144                                       | 0                | 144                                       | \$1,619           | \$233,079                   | \$233,079                                      | 0.051               | \$11,937                        |
| Total Present Value of Discounted Benefits Based on Unit Value |  |                  |   |                   |                             |  |                     | \$1,960,016                     |

#### **Increased Viability of Local Orchard Industry**

Lake San Marcos has been utilized as a local water supply source since the 1960's, and has been primarily used for agricultural uses (Lau 2010). The area surrounding Lake San Marcos has been known for its extensive avocado orchards, which utilize supplies from Lake San Marcos. Increasing water quality issues within Lake San Marcos threaten the potential for this local supply to become unusable. It is estimated that avocados use approximately 2 ½ to 3 acre-feet of water per acre of cropland in San Diego County (Bender and Engle 1988).

Currently, the Vallecitos Water District (VWD), which supplies water to the project area, including the communities and orchards surrounding Lake San Marcos, receives all of their water supply from imported sources through SDCWA (VWD 2005). If water within Lake San Marcos were to become unusable, the local orchard industry would be required to rely on VWD, and therefore imported water, for their water supply source. Due to cost constraints, it is not economically feasible for local avocado farmers to switch to utilizing imported water supplies. As described above, imported water costs range from \$864 to \$1,079 per acre in 2011, inclusive of all MWD and SDCWA costs but exclusive of VWD costs. A recent assessment of the local avocado industry demonstrated that increasing costs, including the cost of water,

can substantially reduce the profitability and therefore the viability of the local avocado industry (Takele et al 2002).

Declining water quality of Lake San Marcos could potentially render this local water supply source unusable for agricultural purposes. Due to the high prices associated with imported water, it would not be reasonable in terms of long-term viability, for local agricultural users to rely on imported supplies. Conversely, reports demonstrate that other counties such as Riverside County have reduced water supply costs (Takele et al 2002). Therefore, it is possible that local avocado farmers within and surrounding the project area would move from the County of San Diego if the local water supply were to be deemed unusable.

The San Diego Farm Bureau states that the local agricultural industry within San Diego County provides a \$5.1 billion annual value to the economy (Farm Bureau of San Diego County n.d.). Similarly, the County of San Diego reports that the annual value of the local avocado industry increased from \$127,099,496 in 2007 to \$144,694,905 in 2008 (County of San Diego 2008). This project, by increasing water availability and quality within Lake San Marcos, could potentially increase the viability of avocado farming within the project area. Although this benefit was not monetized, economic estimates provided for the avocado industry demonstrate that there would be substantial local economic benefits as a result of the *San Marcos Creek Floodway Improvement Project*.

### **Water Supply Reliability**

The reliability of a water supply refers to the ability to meet water demands on a consistent basis, even in times of drought or other constraints on source water availability. This proposal would increase the water supply reliability of Lake San Marcos by reducing pollutant influxes. The total capacity of the lake is estimated to be approximately 658 AF.

Although interest in water supply reliability is increasing, only a few studies have directly attempted to quantify its value. The results from these studies indicate that residential and industrial (i.e., urban) customers seem to value supply reliability quite highly. Stated preference studies find that the annual value of reliability ranged from \$93 to \$489 per household (updated to 2009 dollars) for total reliability (i.e., a 0% probability of their water supply being interrupted in times of drought) (SDCWA 2008).

The challenge for use of these values to determine a value of the project is recognizing how to reasonably interpret these survey-based household monetary values. The values noted above reflect a willingness-to-pay to ensure complete reliability (zero drought-related use restrictions in the future), whereas this proposal would increase overall reliability, but would not guarantee 100% reliability. Thus, the dollar values from the studies will probably overstate the reliability value provided by the project.

### **Distribution of Project Benefits and Identification of Beneficiaries**

This project would avoid imported water purchases by providing water quality benefits that would replace the need for local golf courses to blend with imported water to reduce nutrient and TDS levels. This benefit would be accrued by local and regional beneficiaries. Local beneficiaries would include project partners (VWD), as well as local residents and rate payers who would not have to accrue costs associated with increased imported water imports. Similarly, regional entities such as SDCWA member agencies as well as regional residents and rate payers would benefit because avoiding imported water imports for local golf courses would increase imported water supply reliability for other users.

In addition, this project would potentially result in water quality benefits to Lake San Marcos (refer to Attachment 9), which would increase the reliability of this water source for local supply. Therefore, the project could potentially support the long-term viability of the local avocado growing industry, as well as a larger network of agricultural suppliers and the Farm Bureau.

**Table 8-7: Project Beneficiaries Summary**

| Local  | Regional   | Statewide             |
|--|--|-----------------------|
| Project partners (VWD), residents/rate payers, and local avocado growers and consumers | SDCWA member agencies, residents/rate payers, and agricultural industry and suppliers, including Farm Bureau | <i>Not applicable</i> |



### Project Benefits Timeline Description

This project would provide water reliability benefits following project construction in 2014 and through the project's 46-year lifetime (until 2060).

### Potential Adverse Effects from the Project

Any potential short-term construction impacts associated with project construction will be mitigated through the environmental documentation and permitting processes. No long-term adverse effects are expected as a result of the proposed project.

### Uncertainty of Benefits

Uncertainties relating to the water supply benefits of this project are summarized below in Table 8-8.

**Table 8-8: Omissions, Biases, and Uncertainties and their Effect on the Project**

| Benefit or Cost Category                               | Uncertainty Category    | Likely Impact on Net Benefits* | Comment   |
|--|-------------------------|--------------------------------|---|
| Avoided Imported Water Purchases                       | Climate Change          | +/-                            | Projected water rates are based on "normal year" expectations, whereas dry year conditions will add additional cost pressures. Climate change may increase evaporation and transpiration, resulting in reduced water supplies and putting upward pressure on water prices (holding demand constant). The future price of MWD, and therefore SDCWA, water may be understated and thus net benefits associated with this project would likely increase.                     |
|  | Regulatory/Legal        | +                              | Recent regulatory/legal issues, specifically those surrounding the Bay-Delta ecosystem with respect to operation of the SWP, increase the likelihood that SDCWA surface water supplies from the SWP will be reduced in the future. As a result, prices may increase at higher rates than experienced in the recent past. The future price of MWD, and therefore SDCWA, water may be understated and thus net benefits associated with this project would likely increase. |
|  | Increased Water Demands | +/-                            | SWP and CRA water users may increase demand, which may result in higher rates (holding supply constant). Population projections are forecasted based on a host of assumptions, and result in uncertainty about actual future demand for California water.   |
|  | SDCWA Water Rate        | +/-                            | Net benefits of avoided water imports are computed using the current projected treated SDCWA water rate as the cost of avoided water supply. Considering that water rates vary substantially over time, this value is subject to change.  |
|  | Volume of Blended Water | +/-                            | This analysis conservatively assumed that the CDC would blend local water supplies with one-third imported water supplies to address local water quality issues concerning TDS and nutrients. Blending ratios vary due to many factors, and could vary based on water supply, water quality, climate, demands, and other parameters.  |
| Economic Benefits Associated with the Avocado Industry |                         | ++                             | Due to the substantial economic impact that agriculture has within San Diego County, it is highly likely that if these benefits were monetized, they would contribute substantially to the benefits expected from this proposal.  |
| Water Supply Reliability                               |                         | +                              | The monetized value of reliability is not included in the benefit-cost comparison (refer to Attachment 10). If this value had been monetized in the overall benefit-cost analysis, it would increase net benefits.  |

\* Magnitude of effect on net benefits

+/- (negligible or unknown); + (moderate positive); ++ (significant positive); - (moderate negative); -- (significant negative)

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